Land Use Capability Assessment: 2 Ashworth Rd, Ohoka

Clients: Ohoka Farm Holdings Limited

Land Use Capability Assessments

Land Use Capability Assessment: 2 Ashworth Rd, Ohoka, 7692

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Prepared for:

Ohoka Farm Holdings Limited

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Contents

Summary

Project and Client

- This Land Use Capability (LUC) assessment has been prepared for Ohoka Farm Holdings, 2 Ashworth Road, Ohoka.

Objective

- The report provides a 1:12,500 scale soil and LUC map of the property. The LUC map is based on Lynn et al., (2009) version of the Land Use Capability Survey Handbook. The LUC information was reclassified into maps showing the areas of Highly Productive Land (HPL) (definition: LUC Class 1-3 land) as defined in the National Policy Statement for HPL (NPS-HPL).

Method

- 133 observations were made of soils and land at the 78 ha subject site to produce a 1:12,500 scale site specific LUC map of the property. The 1:12,500 LUC map was then reclassified into LUC Class 1-3 land (HPL) and LUC Class 4-8 land (Other Land).

Findings

- The current version of 1:50,000 (regional) scale New Zealand Land Resource Inventory (NZLRI) layer shows the land parcel at 2 Ashworth Road, Ohoka contains LUC Class 3s5 and 3w1 land.

- Using the current version of 1:50,000 (regional) scale New Zealand Land Resource Inventory, the property and immediate surround area is classified as HPL (LUC 1-3).

- The current version of regional 1:50,000 scale S-map layer shows the site contains very shallow to moderately deep Argillic Pallic Soils on the slightly elevated portion of the property, and shallow to moderately deep Argillic Pallic and Gley Soils on the low lying (eastern portion) of the site.
- At the regional scale both the NZLRI-LUC layer and S-map show that the entire site contains HPL.
- The new more detailed 1:12,500 scale S-map soil and LUC maps of the site shows:
  - On the higher terrace of the property (western side), 60.8 ha of land is classified as 80% LUC 4s (correlates to the regional NZLRI LUC classification of 4s7) and 20% LUC 3s (which correlates to the regional NZLRI LUC classification of 3s5)
  - Having a mixture of Class 4s and 3s (4s7 and 3s5 equivalent) land adds complexity in terms of differential germination times, differences in ability for the soil to store plant available moisture across the site at key growing times for crops and ultimately differences in yield where expensive differential irrigation is not used. A mixture of 80% very shallow LUC 4s (4s7 equivalent) and 20% shallow LUC 3s (3s5 equivalent) land underlain by gravel means that it can only be cropped occasionally (1 in 5 years or less), is limited to direct drilling techniques, and crops

have a higher risk of failure due to drought if differential irrigation is not available. Although this portion of land contains some shallow 3s land, LUC Assessments argue that this section should not be considered HPL given the limitations imposed by the LUC 4s portion.

- 11.8 ha of land in the north of the site contained a mixture of 3w and 3s land (correlates with the 3w1 regional scale LUC classification). The area in the north contained clay loam textured Gley Soils with gravels occurring between 20-45 cm. This meets the definition of HPL (LUC 1-3).

- The eastern-most part of the property contained Typic Orthic Gley, Argillic Orthic Gley (clay textured) and Typic Perched-Gley Pallic Soil. It was found that 4.8 ha of land was noticeably different to the rest of the farm in terms of soil and is reflected in the LUC classification i.e., the limitation is wetness rather than depth of gravels and stoniness of the soil. For this reason, the land has been classified as 4w and therefore does not meet the criteria for HPL.

- Overall, LUC Assessments Ltd has found that from a soil and LUC perspective, 11.8 ha of the property is classified as HPL according to the NPS-HPL definition, and 65.6 ha of land was not classified as HPL.

1 Introduction

This report provides an evaluation about the nature and extent of Highly Productive Land (HPL) at 2 Ashworth Rd, Ohoka, Christchurch. HPL is mapped based on the regional scale New Zealand Land Resource Inventory (NZLRI) map snd more detailed regional scale mapping of S-map converted to Land Use Capability (LUC) units using the LUC Survey Handbook (Lynn et al., 2009). The mapping is more detailed site-specific mapping. The 1:12,500 scale mapping as conducted in this survey is 16 times more detailed than 1:50,000 scale mapping in the NZLRI or S-map in S-map Online. The report concludes how much HPL is present on the site, where it is located, and describes the productive capacity of the land on the site.

2 Background

2.1 New Zealand Land Resource Inventory

The 78 ha land parcel lies 14 km inland of Pegasus Bay in between the Waimakariri and Ashley River. The site is located across a flat, low alluvial terrace (Figure 1).

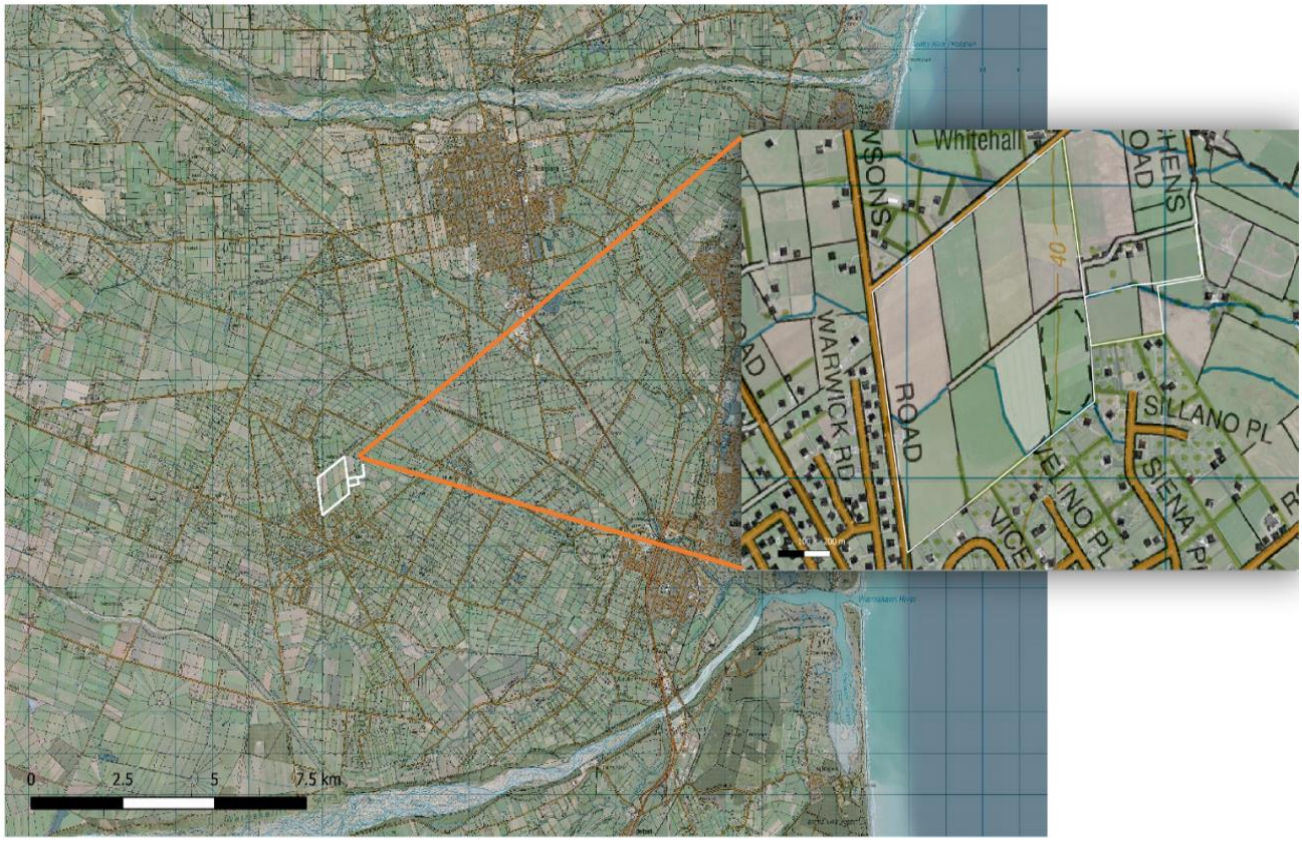

Figure 1: Subject site (white outline), Ohoka

The current version of 1:50,000 (regional) scale New Zealand Land Resource Inventory (NZLRI) layer shows the land parcel at 2 Ashworth Road, Ohoka contains LUC Class 3s5 and 3w1 land (Figure 2). This land is flat to undulating alluvial plains and terraces with shallow Recent Soils, over gravels.

Using the current version of 1:50,000 (regional) scale NZLRI, the property and immediate surround area is classified as HPL (LUC 1-3) (Figure 3).

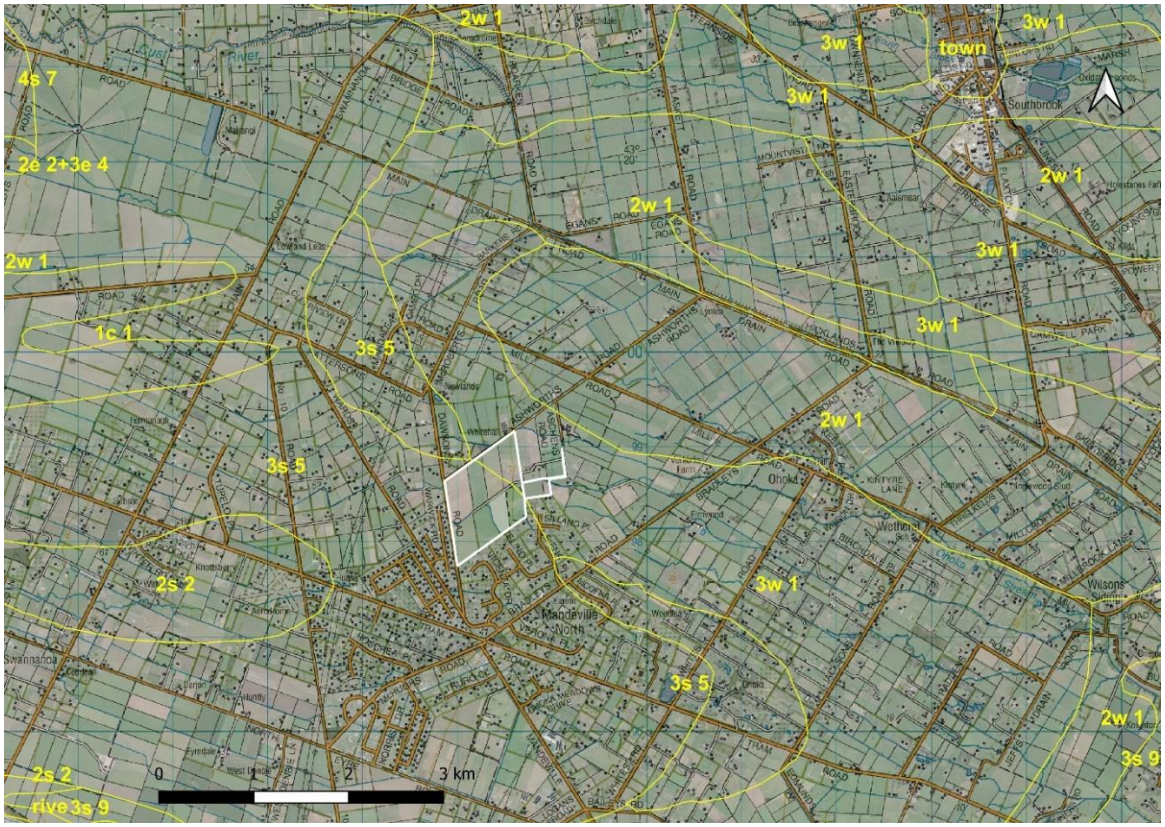

Figure 2: LUC map units from the legacy 1:50,000 NZLRI map

Figure 3:Highly Productive Land map according to the NZLRI

2.2 Soils

The surrounding area at the site consists of a series of broad fans, terraces, and floodplains with a flat to gently undulating surface which have been built up by the Ashley and Waimakariri Rivers.

2.2.1 S-map

The current version of the 1:50,000 (regional) scale S-map layer shows the site contains very shallow to moderately deep Argillic Pallic Soils on the slightly elevated portion of the property, and shallow to moderately deep Argillic Pallic and Gley Soils on the low laying (eastern portion) of the site (Figure 4).

Figure 4: NZSC map with siblings in each map unit from S-Map Online

One the slightly higher terrace (western side), S-map shows that 4 Pallic Soil siblings are likely to occur. These are the Pahau_2a.1 (50%), Darnley_1a.1 (30%), Darnley_6a.1 (10%), Darnley_7a.1 (10%). A schematic showing the physical properties of S-map siblings is shown in Figure 5.

Pahau_2a.1 is a moderately deep (70-90cm) imperfectly drained Mottled Argillic Pallic Soil. According to the LUC Survey Handbook (2009), this would be classified as LUC 3w.

The Darnley siblings are all moderately well drained Pallic soils but vary according to soil depth. Darnely_6a.1 is very shallow (0-20 cm), according to the LUC Survey Handbook (2009), this would be classified as LUC 4s. Both Darnley_1a.1 and Darnley 7a.1 have shallow soil depths (25-60 cm for Darnley_1a.1 and 15-35 cm for Darnley 7a.1). According to the LUC Survey Handbook (2009), these siblings would be classified as LUC 3s, although the shallower variant is on the threshold of being classified as LUC Class 4s land. The presence of these siblings in the regional scale S-map map indicates that the soil depth has been observed to vary across the general area by pedologists in the past.

On the lower section of the property (eastern section) S-map shows there two Gley and two Pallic soil siblings that are likely to occur. These are Leeston_1a.1 (40%), Pahau_31a.1, (30%), Darnley_1a.1 (15%), and Leeston_3a.1 (10%).

Leeston_1a.1 and Leeston_3a.1 are poorly drained Argillic Orthic Gley Soils. Both siblings have a shallow soil depth (20-45cm for Leeston_1a.1 and 20-40 cm for Leeston 3a.1). According to the LUC Survey Handbook (2009), they can be classified as 3w but are on the border of being classified as Class 4w. Pahau_31a.1 is an imperfectly drained, moderately deep (45-90 cm), Mottled Argillic Pallic Soil. According to the LUC Survey Handbook (2009), this would be classified as LUC 4w.

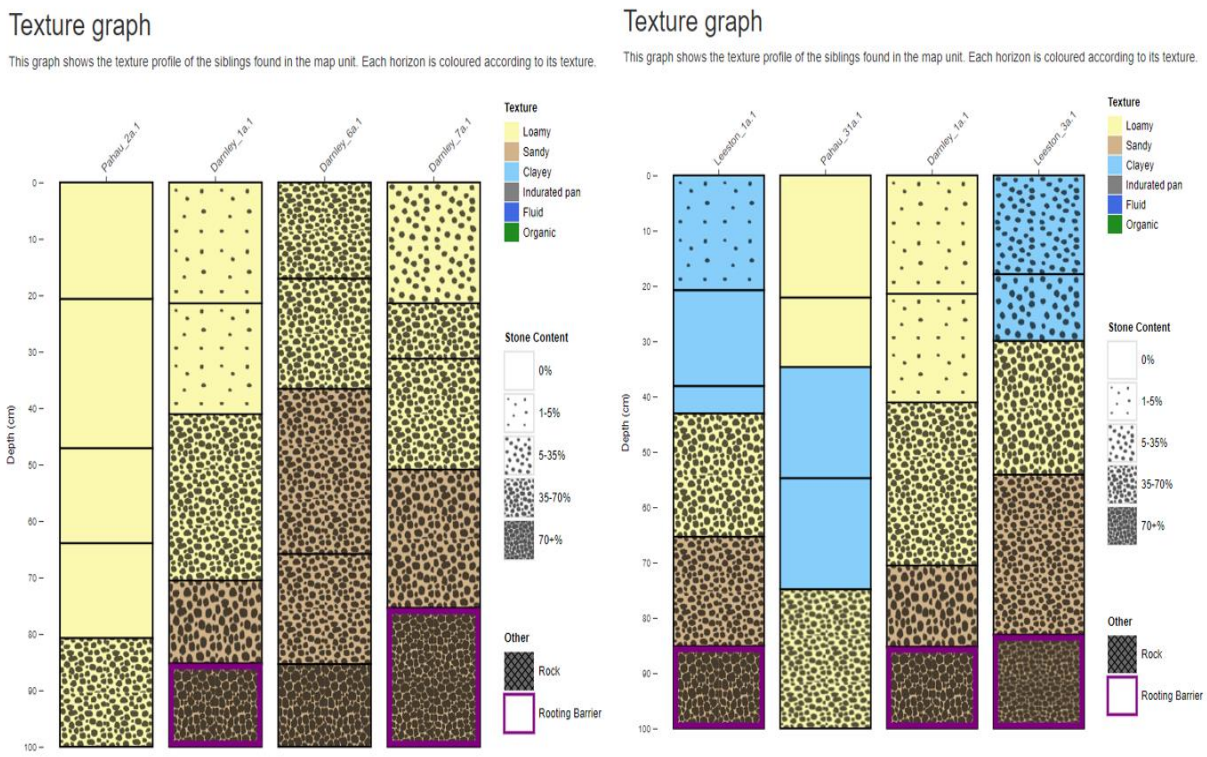

Figure 5: Texture graph, stone content and soil depth of S-map siblings found at the site

At this site, S-map shows the eastern portion of the site contains a mixture of LUC Class 3 and LUC Class 4 land. Because the polygon containing Pallic Soil siblings contains LUC Class 3 and less than 15% LUC Class 4 land, it can be classified as HPL. On the lower part of the site, S-map shows there is 55% LUC Class 3 land and has been classified as HPL (Figure 6).

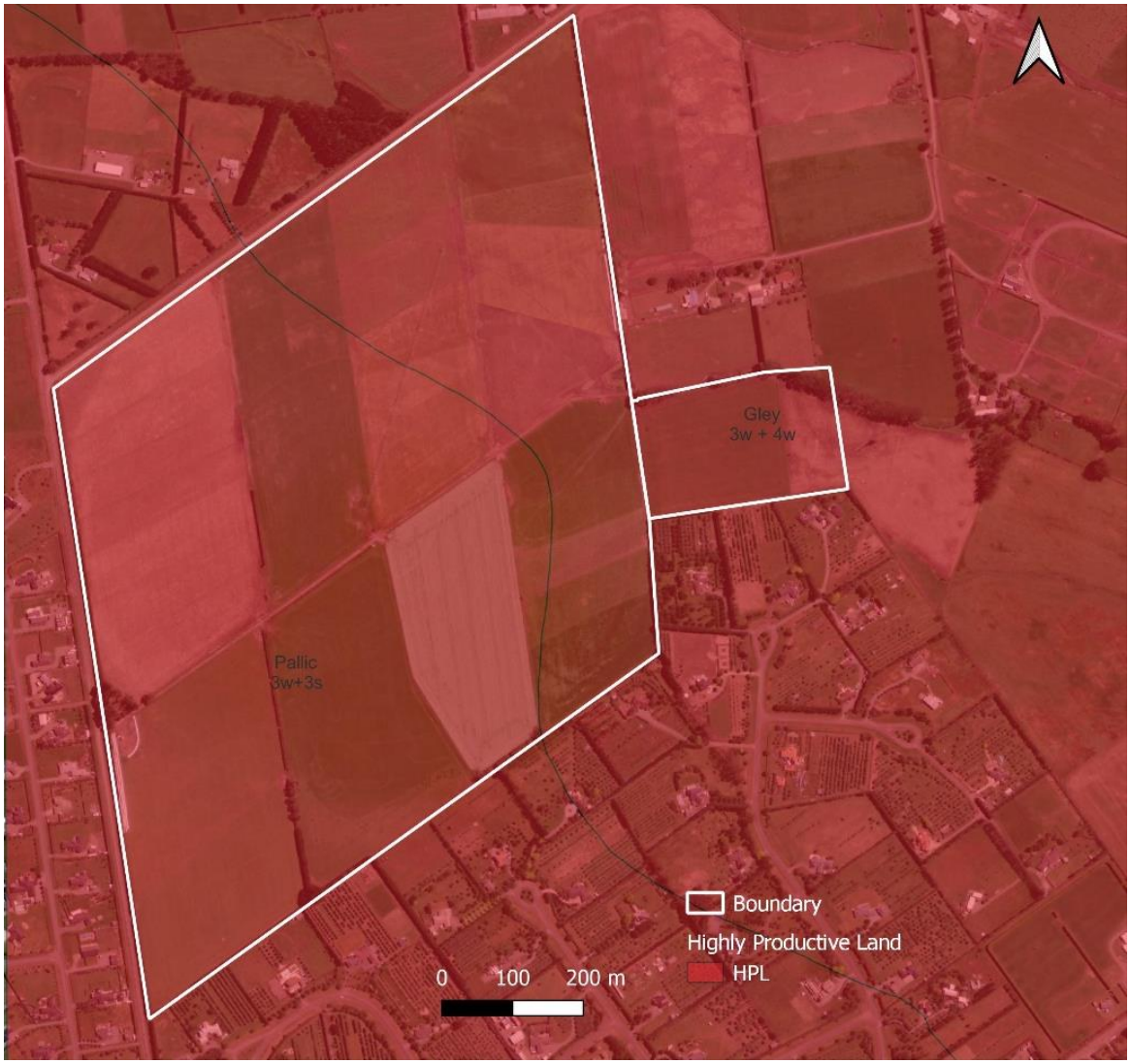

Figure 6: LUC allocations according to S-map. Highly productive land map based on LUC 1-3

The mapping in S-map Online has been determined to be "more detailed mapping" by MfE Guidance Notes about the National Policy Statement for HPL. It is more detailed than the NZLRI because it has a higher observation density in it, but it is still published on S-map Online as a 1:50,000 scale (regional scale) map.

At this site, both the NZLRI-LUC layer and S-map show that the entire site contains HPL.

3 Method

3.1 Field survey

LUC Assessments Ltd undertook a soil and LUC survey at 1:12,500 scale over on the 9-10 August 2023. The resultant map is 16 times more detailed than the 1:50,000 scale S-map Online map, but is in S-map format.

LUC Assessments Ltd recorded soil profiles at 133 locations spread across the site using visual observations of the soil surface, oblique photography, and augering holes using a handheld

Eijkelkamp soil auger. Soil profiles were classified and correlated with S-map soil siblings using S-map Online.

The 1:12,500 scale soil map has been correlated with the surrounding 1:50,000 scale maps and LUC Assessments Ltd has taken care in our findings to relate the detail found in the more detailed site-specific mapping with the findings from the regional (1:50,000) scale S-map and the regional (1:50,000) scale NZLRI map in and around the subject site, to avoid granularity issues based on ad hoc more detailed mapping.

3.2 Assignment of LUC Classes and subclasses

The factors that LUC Assessments Ltd investigated in soil profiles on the site included soil textures, depth to gravels and extent of rising water tables in the area. These properties influence LUC Classes through the degree of limitations of the capability of the land in the map units exerted by soil or wetness limitations. LUC classes and subclasses were assigned to each soil profile according to Lynn et al., (2009). Specific attention was given to the soil depth, texture and stoniness of each of the soil horizons and of the overall soil profile. The presence and depth of hydromorphic features and depth to gravel in Section 3.3.2 and 3.3.3 in Lynn et al., (2009) informed the LUC classes assigned to each soil profile and LUC map unit.

4 Results

The locations of LUC Assessments Ltd observations are shown in Figure 7. The data recorded and the classifications provided for soil profiles at each location is provided in Appendix 1.

Figure 7: Location of observations with the LUC allocation as recorded in Appendix 1.

The new site-specific 1:12,500 scale soil map (S-mat format) is provided in Figure 8.

The new site-specific 1:12,500 scale soil map shows the property contains very shallow (Darn_6a.1) and shallow stoney Pallic Soil (Darn 7a.1 and Darn_1a.1) on most of the property (western section), shallow Pallic Soil (Darn_1a.1) with moderately deep Gley Soil in the northern part of the section and Orthic Gley Soil (Lees_1a equivalent) and Perched Gley Pallic Soil (Pahau_31a.1 equivalent) in the most eastern part of the property.

Figure 9 shows the new site-specific 1:12,500 scale LUC map and associated site-specific 1:12,500 scale HPL map (HPL as defined by LUC Classes 1-3).

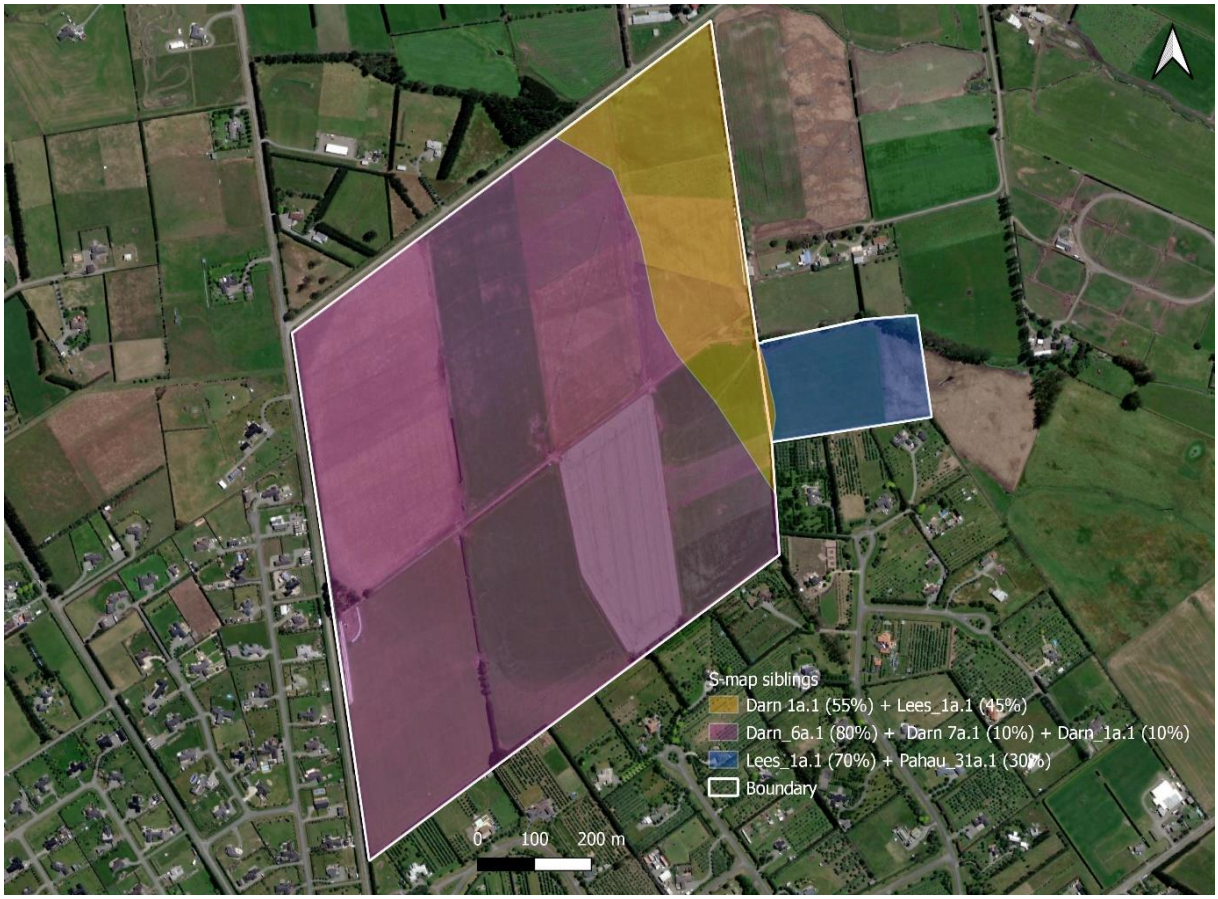

Figure 8: New 1:12,500 scale soil map showing S-map sibling equivalent soils within the boundary

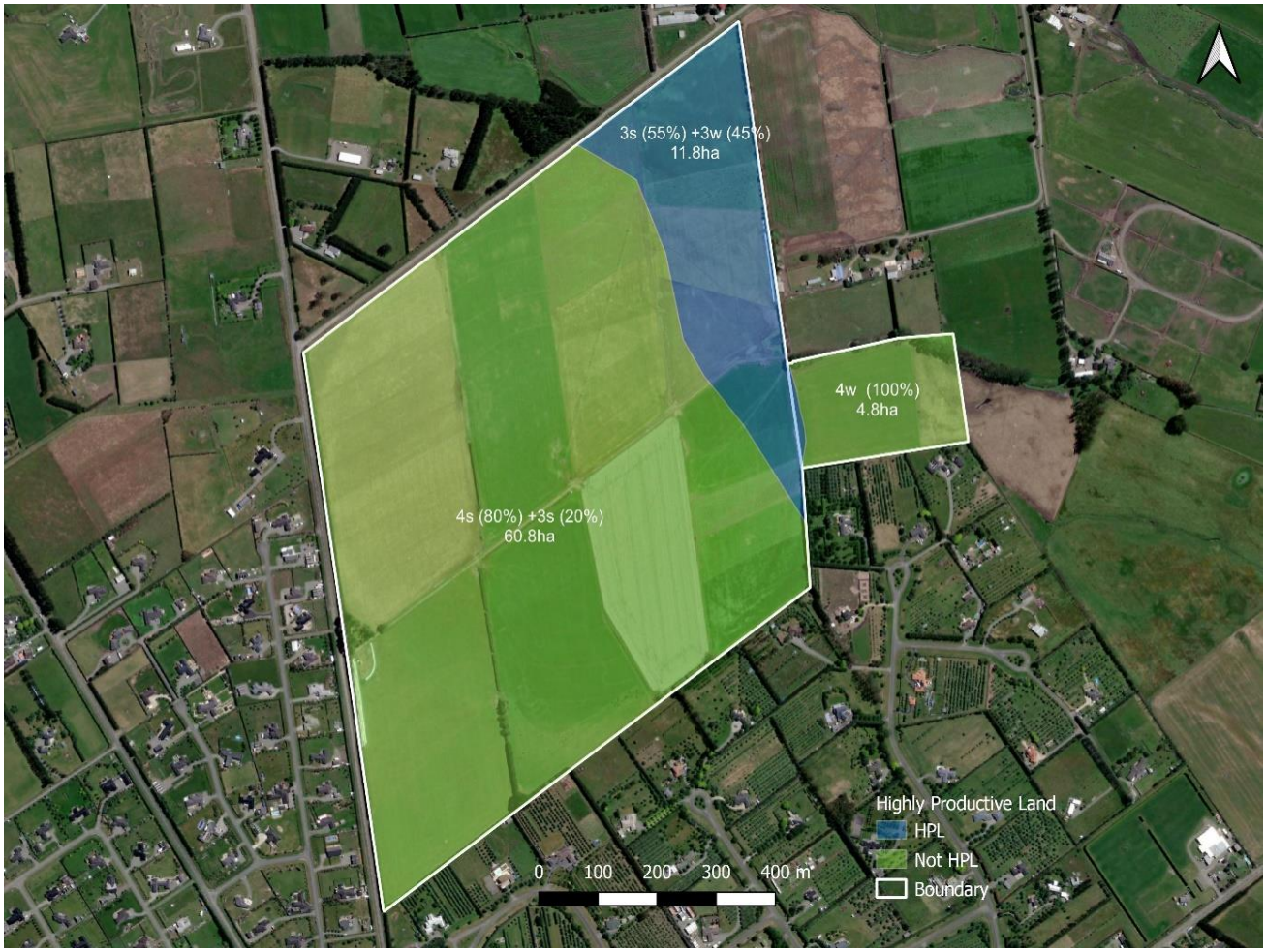

Figure 9: New 1:12,500 scale land use capability map

There are two dominant limitations denoted on the LUC map. One subclass has been denoted an "s" indicating a soil limitation. The "s" limitation is related to soil depth and represents limited available soil moisture due to gravels present at very shallow to shallow depths.

The definition of soil limitation is defined in section 3.3.3 of Lynn et al., (2009) and a stylised depiction of a soil limitation due to stones shown in Figure 10 of the LUC Handbook by Lunn et al., (2009). The difference between stoney soil with a classification of LUC Class 3s and Class 4s is whether the gravels occur 20-45 below the surface (3s) or <20 cm (4s).

The other subclass shown on the map is denoted with "w" indicating a wetness limitation. When assessing wetness limitation, LUC Assessments factor in the presence or absence and depth of hydromorphic features shown in the soil profile. The texture of the soil is also considered when allocating the LUC Class. Loamy textured soil is more readily drained (removable limitation) than clay textured soils and therefore has a "better" LUC Class.

On the higher terrace of the property (western side), LUC Assessments found 60.8 ha of land classified as LUC 4s (which correlated to the regional NZLRI LUC classification of 4s7) and LUC 3s (which correlated to the regional NZLRI LUC classification of 3s5) (Figure 10).

Figure 10: An exposed fence line found at the property shows the gravel content at the surface which stops the auger from being able to be driven into the soil i.e., LUC Class 4s (correlated to 4s7)

According to the LUC Survey Handbook, LUC Class 4s land has severe physical limitations to arable use and is suitable for no more than 1-in-5 year arable cropping and is suitable for pasture and forestry. It is unsuitable for market gardening. There are high risks of drought impacting on yield at harvest and even crop survival in LUC Class 4s land units.

According to the LUC Survey Handbook, LUC Class 3s land on stony flats and terraces has moderate physical limitations to arable use with low moisture holding capacity (droughty) and is vulnerable to leaching nitrogen when intensively used. It has moderate physical limitations to arable use. It is suitable for cultivated crops, vineyards and berry fields (if there is available irrigation water), pasture (grazing is the current land use), and tree crops.

Having a mixture of Class 4s and 3s (4s7 and 3s5 equivalent) land adds complexity in terms of differential germination times, differences in ability for the soil to store plant available moisture across the site at key growing times for crops and ultimately differences in yield where expensive differential irrigation is not used. Soils with varying soil depths (also indicated in S-map) means the productive capacity of this site is low if measured by the range of land uses that can be sustainably supported on the site. Versatility and productive capacity involve consideration of the frequency of cropping that can occur, and the risk that the crop will have a low yield, fail, or require costly inputs. A mixture of 80% very shallow LUC 4s (4s7 equivalent) and 20% shallow LUC 3s (3s5 equivalent) land underlain by gravel means that it can only be cropped occasionally (1 in 5 years or less), is limited to direct drilling techniques, and crops have a higher risk of failure due to drought if differential irrigation is not available.

Although this portion of land contains some shallow 3s land, LUC Assessments argue that this section should not be considered HPL given the limitations imposed by the LUC 4s portion.

LUC Assessments found that the section in the north contained 11.8 ha of a mixture of 3w (correlates with the 3w1 regional scale LUC classification) and 3s land. The area in the north contained clay loam textured Gley Soil with gravels occurring between 20-45 cm (Figure 11). This meets the definition of HPL (LUC 1-3).

Figure 11: A drain near the north of the property shows loamy textured Gley Soil over gravels.

LUC Assessments found that the most eastern portion of the property contained Typic Orthic Gley, Argillic Orthic Gley (clay textured) and Typic Perched-Gley Pallic Soil. It was found that 4.8 ha of land was noticeably different to the rest of the farm in terms of soil and is reflected in the LUC Classification i.e., the limitation is wetness rather than depth of gravels and stoniness of the soil. LUC Assessments have allocated this portion of the section as 4w and therefore does not meet the criteria for HPL. This part was allocated 4w rather than 3w given that the soil wetness limitation could not easily be removed through drainage (see section 3.3.5.2 from the LUC Handbook Lynn et al., 2009). Figure 12 shows the change in elevation across the property; the wettest part of the property is on the lowest elevation. The change in soils and therefore LUC is also reflected in the regional scale mapping however more detailed mapping shows the change in soil and LUC occurs further east of the property.

Figure 12: coloured DEM over a topographic map illustrating the change is elevation from the west (highest part) to east side (lowest part) of the property.

Overall, LUC Assessments Ltd has found that from a soil and LUC perspective, 11.8 ha of the property is classified as HPL according to the NPS-HPL definition and 65.6 ha of land was not classified as HPL.

5 Conclusion

When basing HPL maps off the regional (1:50,000) scale NZLRI information, the site appears to contain Class 3s5 and Class 3w1 land. S-map suggests that there is a mixture of soil siblings with varying soil depths on the higher part of the property and varying degrees of wetness limitation on the lower part of the property. Despite variations in sibling properties, both regional scale maps show the entire property contains HPL.

When LUC Assessments Ltd mapped the site in S-map and LUC formats in over 16 times more detail than the regional scale NZLRI and S-map layers (the new maps were 1:12,500 scale), 11.8 ha of the property is classified as HPL according to the NPS-HPL definition. LUC Assessments found 65.6 ha of land that was not classified as HPL.

LUC Assessments found that the section in the north contained 11.8 ha of a mixture of LUC Class 3w (correlates with the 3w1 regional scale LUC classification) and 3s land. The area in the north contained clay loam textured Gley soils with gravels occurring between 20-45 cm. This meets the definition of HPL (LUC 1-3).

On the higher terrace of the property (western side), LUC Assessments found 60.8 ha of land classified as LUC 4s (which correlated to the regional NZLRI LUC classification of 4s7) and LUC 3s (which correlated to the regional NZLRI LUC classification of 3s5). Having a mixture of Class 4s and 3s (4s7 and 3s5 equivalent) land adds complexity in terms of differential germination times, differences in ability for the soil to store plant available moisture across the site at key growing times for crops and ultimately differences in yield where expensive differential irrigation is not used. Soils with varying soil depths (also indicated in S-map) leads to differential ripening of any crops that were to be grown on the site if this was to be converted to an arable or horticultural block. A mixture of 80% very shallow LUC 4s (4s7 equivalent) and 20% shallow LUC 3s (3s5 equivalent) land underlain by gravel means that it can only be cropped occasionally (1 in 5 years or less), is limited to direct drilling techniques, and crops have a higher risk of failure due to drought if differential irrigation is not available. Although this portion of land contains some shallow 3s land, LUC Assessments argue that this section should not be considered HPL given the limitations imposed by the LUC 4s portion.

The most eastern portion of the property LUC Assessments found that the site contained Typic Orthic Gley, Argillic Orthic Gley (clay textured) and Typic Perched-Gley Pallic Soil. It was found that 4.8 ha of land was noticeably different to the rest of the farm in terms of soil and is reflected in the LUC Classification i.e., the limitation is wetness rather than depth of gravels and stoniness of the soil. LUC Assessments have allocated this portion of the section as 4w and therefore does not meet the criteria for HPL.

Overall, LUC Assessments Ltd has found that from a soil and LUC perspective, 11.8 ha of the property is classified as HPL according to the NPS-HPL definition and 65.6 ha of land was not classified as HPL.

6 References

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Appendix 1 – Soil observations

LUC according to Lynn et al. (2009)

GOT = Typic Orthic Gley

GOJ= Argillic Orthic Gley

PIT = Typic Immature Pallic

PID = Pedal Immature Pallic

PJT= Typic Argillic Pallic

S-map sibling information: Mr-soils with rounded stones, Mg-soils with gravels within 45 cm, (Hs) hard sandstone/greywacke, L-loamy, m=moderate permeability s=slow permeability (A)=flat ground 0-3 °

NZSC allocations according to Hewitt (2010)

Horizon designation (Milne et al., 1995) in brackets (Webb & Lilburne, 2011)

ID	NZSC	Sibling	LUC	Description designation (depth cm)	Photo
399	PID	Darn_6a.1	4s	PID; Mr (Hs);L(m) (A) Gravels at surface	
400	PID	Darn_6a.1	4s	PID; Mr (Hs);L (m) (A) Gravels at surface	
401	PID	Darn_7a.1	4s	PID; Mr (Hs);L (m) (A) Gravels at 15cm	

402	PID	Paha_2a.1	3w	0-25 Ap (tSLw) 25-45 B (g) (SLFs) 45-60 Bg1 (SLFs) 60-90 Bg1(SLFs) 90+ BC (VLc) PID; Mg (Hs);L (m) (A)	
403	PID	Darn_1a.1	3s	0-25 Ap (tSLw) 25-40 B (g) (SLFs) 40+ C (VLc)	
404	PID	Paha_31a.1	3w	0-25 Ap (tSLw) 25-40 Bw(g) (SLFs) 45-60 Bg1 (SLFs) 60+ BC (VLc)	

406	PID	Darn_1a.1	3s	0-25 Ap (tSLw) 25-43 Bw(g) (SLFs) 43+ BC (VLc)	
407	PJT	Darn_6a.1	4s	Gravels at surface	
408	PJT	Darn_1a.1	3s	Gravels at 30 cm	
409	PJT	Darn_6a.1	3s	Gravels at surface	
410	PJT	Darn_1a.1	3s	Gravels at 15 cm	
411	GOT	Lees_1a.1	4w	0-25 Ap (tSLw) 25-40 Bwg (SLFs) 40-50 Bg (SLFs) 50+ BCg (VLc) GOT Mg (Hs); L;m (A)	
412	PJT	Darn_1a.1	4s	Gravels at 15 cm	
413	PJT	Darn_1a.1	4s	Gravels at 15 cm	

414	PJT	Darn_1a.1	3s	Gravels at 35 cm	
415	PJT	Darn_6a.1	4s	Gravels at surface	
416	PJT	Darn_6a.1	4s	Gravels at 15 cm	
417	PJT	Darn_6a.1	4s	Gravels at 15 cm	
418	PJT	Darn_6a.1	4s	Gravels at 15 cm	
420	PJT	Darn_6a.1	4s	Gravels at 15 cm	
421	PJT	Darn_6a.1	4s	Gravels at surface	
422	PJT	Darn_6a.1	4s	Gravels at surface	
423	PJT	Darn_7a.1	3s	Gravels at 10 cm	
424	PJT	Darn_6a.1	4s	Gravels at surface	
425	PJT	Darn_6a.1	4s	Gravels at surface	
426	PJT	Darn_7a.1	4s	Gravels at 10 cm	
427	PJT	Darn_7a.1	4s	Gravels at 15 cm	
428	PJT	Darn_1a.1	3s	Gravels at 15 cm	
429	PJT	Darn_1a.1	3s	Gravels at 20 cm	
430	PJT	Darn_6a.1	4s	Gravels at 15 cm	
431	PJT	Darn_1a.1	3s	Gravel at 35 cm	

432	PJT	Darn_1a.1	3s	
433	PJT	Darn_1a.1	3s	
434	PJT	Darn_1a.1	3s	
435	GOT	Lees_1a.1	3w	Gravels at 55cm
436	GOT	Lees_1a.1	3w	0-25 Ap (tSLw) 25-45 Bg (SLw) 45+ BCg (VLc) GOT Mg (Hs); L;m (A) 
437	GOT	Lees_1a.1	3w	Gravels at 40 cm

438	PIT	Darn_1a.1	3s	Gravels at 30 cm	
439	GOT	Lees_1a.1	3w	Gravels at 40 cm	
440	GOT	Lees_1a.1	4w	0-25 Ap (tSLw) 25-55 Bg (LFs) 55+ BCg (VLc) GOT Mg (Hs); L;m (A)	

441	GOT	Lees_1a.1	4w	0-25 Ap (tSLw) 25-40 Bwg (SLFs) 40-50 Bg1 (SLFs) (clay loam) 50+ BC (VLc)	
442	GOT	Lees_1a.1	4w	0-30 Ap (tSLw) 30-40 Bg (Lw) 40-60 Bg1 (LFs) 60+ BC (VLc) GOT; Ms (Hs);L (m) (A)	
443	GOJ	Lees_1a.1	4w	GOT; Ms (Hs);L/C (m) (A)	
444	GOJ	Lees_1a.1	4w	GOT; Mr (Hs);L (m) (A)	

445	GOJ	Lees_1a.1	4w	0-15 Ap (tLw) 15-25 Bg (SLw) 25-47 BCg (LCs) clay laom 47-100 2C (VLc) GOJ; Mr (Hs);L (m) (A)	
446	PJT	Darn_6a.1	4s		
447	GOT	Lees_1a.1	4w		
448	PPJ	Pahau_31a.1	4w		
449	PPJ	Pahau_31a.1	4w		
450	PPJ	Pahau_31a.1	4w		

451	GOO		4w	Peaty loam to 80 cm-poorly drained	
452	PPJ	Pahau_31a.1	4w	0-30 Ap (tSLs) 30-50 Bwg (SLFs) 40-50 BCtg (YC) 50-90 BC (YC) 90+2C VLl PPJ;Mg(Hs);L/C m/s (A)	

454	PIT	Darn_7a.1	3s	Gravels at 30 cm	
455	PJT	Darn_7a.1	3s		
456	PJT	Darn_7a.1	3s		
457	PJT	Darn_7a.1	4s		
458	PJT	Darn_6a.1	4s		
459	PJT	Darn_6a.1	4s		
460	PJT	Darn_6a.1	4s		
461	PJT	Darn_6a.1	4s		
463	PJT	Darn_6a.1	4s		
464	PJT	Darn_6a.1	4s		
465	PJT	Darn_6a.1	4s		
466	PJT	Darn_6a.1	4s		
467	PJT	Darn_6a.1	4s		
468	PJT	Darn_6a.1	4s		
469	PJT	Darn_6a.1	4s		
472	PJT	Darn_6a.1	4s		
473	PJT	Darn_6a.1	4s		

474	GOT	Pahau_2a.1	3w	Gravels at 45cm	
475	GOT	Pahau_2a.1	3w		
47	PJT	Darn_1a.1	3s		

48	GOT	Lees_1a.1	4w	0-30 Ap (tLw) 30-40 Bwg (SLw) 40-55 Bg1 (YFs) 55+ BC (VLc) GOT; Mg(Hs);L/C m (A)	
49	GOT	Lees_1a.1	3w	GOT; Mg(Hs);L/C m (A)	
50	GOT	Lees_1a.1	3w	0-15 Ap (tSLw) 15-50 Bg (SLw) 50-100 2C (VLl) GOT; Mg(Hs);L/C m (A)	
51	GOT	Lees_1a.1	3w	0-20 Ap (tSLw) 20-30 Bg1 (SLw) 30-40 Bg2 (YFs) 40-100 2C (VLl) GOT; Mg(Hs);L/C m (A)	
52	PID	Darn_1a.1	3s	0-25 Ap (tSLw) 25-50 Bwg (SLw) 50+ C (VLl)	

				PID; Mr(Hs);L;vs-s
53	PID	Darn_6a.1	4s	PID; Mr(Hs);L;vs
54	PID	Darn_6a.1	4s	PID; Mr(Hs);L;vs
55	PID	Darn_1a.1	3s	0-15 Ap (tSLw) 15-25 Bwg (SLw) 25+ 2C (VLl)
56	PIT	Darn_7a.1	3s	
57	PIT	Darn_6a.1	4s	0-10 Ap (tVLw) 10-20 BC (SLw) 20+ C (VLl) PIT; Mr(Hs);L;vs
58	PIT	Darn_6a.1	4s	PIT; Mr(Hs);L;vs
59	PIT	Darn_6a.1	4s	
60	PIT	Darn_6a.1	4s	PIT; Mr(Hs);L;vs
61	PIT	Darn_6a.1	4s	
62	PIT	Darn_6a.1	4s	
63	PIT	Darn_6a.1	4s	
64	PIT	Darn_6a.1	4s	
65	PJT	Darn_7a.1	3s	
66	PJT	Darn_6a.1	4s	
67	PJT	Darn_6a.1	4s	
68	PJT	Darn_6a.1	4s	
69	PJT	Darn_6a.1	4s	
70	PJT	Darn_6a.1	4s	
71	PJT	Darn_6a.1	4s	
72	PJT	Darn_6a.1	4s	
100	GOT	Lees_1a.1	3ws	
109	GOT	Lees_1a.1	3ws	
110	GOT	Lees_1a.1	3ws	

111	PJT	Darn_6a.1	4s
112	PJT	Darn_6a.1	4s
113	PJT	Darn_6a.1	4s
114	PJT	Darn_6a.1	4s
115	PJT	Darn_6a.1	4s
116	PJT	Darn_6a.1	4s
117	PJT	Darn_6a.1	4s
118	PJT	Darn_6a.1	4s
119	PJT	Darn_6a.1	4s
120	PJT	Darn_6a.1	4s
121	PJT	Darn_6a.1	4s
122	PJT	Darn_6a.1	4s
123	PJT	Darn_6a.1	4s
124	PJT	Darn_6a.1	4s
125	PJT	Darn_6a.1	4s
126	PJT	Darn_6a.1	4s
127	PJT	Darn_6a.1	4s
128	PJT	Darn_6a.1	4s
129	PJT	Darn_6a.1	4s
130	PJT	Darn_6a.1	4s
131	PJT	Darn_6a.1	4s
132	PJT	Darn_6a.1	4s
133	PJT	Darn_6a.1	4s
134	PJT	Darn_6a.1	4s
135	PJT	Darn_6a.1	4s
136	PJT	Darn_6a.1	4s
137	PJT	Darn_6a.1	4s
138	PJT	Darn_6a.1	4s
139	PJT	Darn_6a.1	4s
140	PJT	Darn_6a.1	4s

141	PJT	Darn_6a.1	4s
142	PJT	Darn_6a.1	4s

Figure 13: location of observations with LUC linework

Appendix 2-S-map factsheets

Manaaki Whenua
Landcare Research

SOIL REPORT

Environment Canterbury

Darnley_1a.1

Report generated: 2-Aug-2023 from https://smap.landcareresearch.co.nz

Darn_1a.1 (15% of the mapunit at location (1562498, 5198704), Confidence: Medium)

This information sheet describes the typical average properties of the specified soil to a depth of 1 metre, and should not be the primary source of data when making land use decisions on individual farms and paddocks. S-map correlates soils across New Zealand. Both the old soil name and the new correlated (soil family) name are listed below.

Capture of the base soil information in this region was funded by Environment Canterbury, Manaaki Whenua and MPI.

Soil Classification

Soil Classification:
Typic Argillic Pallic Soils (PJT)

Family Name:
Darnley (Darn)

Sibling Name:
Darnley_1a.1 (Darn_1a.1)

Soil profile material
Rounded stony soil

Depth class (diggability)
Shallow (25 - 60 cm)

Profile texture
silt

Parent Material

Stones/rocks
hard sandstone rock

Soil material
hard sandstone rock

Origin
Alluvium

Soil Sibling Concept

This soil belongs to the Pallic soil order of the New Zealand soil classification. Pallic Soils have pale coloured subsoils, due to low contents of iron oxides, have weak soil structure and high density in subsurface horizons. Pallic Soils tend to be dry in summer and wet in winter. It is formed in alluvial sand silt or gravel deposited by running water, from hard sandstone parent material.

The topsoil typically has silt texture and is slightly stony. The subsoil has dominantly silt textures, with a very gravelly layer from less than 45 cm mineral soil depth to more than 100 cm. The plant rooting depth is 80 - 90 (cm), due to an extremely gravelly horizon with extremely low water storage capacity.

Generally the soil is moderately well drained with moderate vulnerability of water logging in non-irrigated conditions, and has moderate soil water holding capacity. Inherently these soils have a high structural vulnerability and a moderate N leaching potential, which should be accounted for when making land management decisions.

Allan Hewitt ©

Argillic
Pallic

About this publication

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Environment Canterbury
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Darnley_1a.1

Soil physical properties

Depth class (diggability)
Shallow (25 - 60 cm)

Potential rooting depth
80 - 90 (cm)

Rooting barrier
Extremely gravelly

Depth to hard rock
No hard rock within 1 m

Depth to soft rock
No soft rock within 1 m

Depth to stony layer class
Shallow

Texture profile
Silt

Topsoil stoniness
Slightly stony

Topsoil clay range
18 - 30 %

Drainage class
Moderately well drained

Permeability profile
Moderate over slow

Depth to slowly permeable horizon
25 - 60 (cm)

Permeability of slowest horizon
Slow (< 4 mm/h)

Aeration in root zone
Moderately limited

Profile available water

(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)
High (51 mm)	Moderate (81 mm)	Moderate (104 mm)

Dry bulk density

topsoil	subsoil
1.22 g/cm³	1.42 g/cm³

Soil chemical properties

Topsoil P retention
Low (19%)

Soil management factors

Vulnerability classes relate to soil properties only and do not take into account climate or management

Soil structure integrity

Structural vulnerability
High (0.63)

Pugging vulnerability
not available yet

Septic tank installation category
A1 if slope > 15 deg otherwise B4

Contaminant management

N leaching vulnerability
Medium

P leaching vulnerability
not available yet

Dairy effluent (FDE) risk category
D

MGM N Loss Category
Light (on the plains and downs)

MGM P Loss Category
No significant pathways

Water management

Water logging vulnerability
Moderate

Drought vulnerability - if not irrigated
Moderate

Bypass flow
High

Hydrological soil group
C

Relative Runoff Potential

Slope	0-3°	4-7°	8-15°	16-25°	>25°
Risk	L	M	M	M	M

SINDI - Soil quality Indicators

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- Learn about the effect each indicator has on soil quality and some general management practices that could be implemented to improve soil quality.

Darnley_6a.1

Soil physical properties

Depth class (diggability)
Very shallow (0 - 20 cm)

Potential rooting depth
Unlimited

Rooting barrier
No significant barrier within 1 r

Depth to hard rock
No hard rock within 1 m

Depth to soft rock
No soft rock within 1 m

Depth to stony layer class
Shallow

Texture profile
Silt

Topsoil stoniness
Very stony

Topsoil clay range
15 - 20 %

Drainage class
Moderately well drained

Permeability profile
Moderate over slow

Depth to slowly permeable horizon
45 - 65 (cm)

Permeability of slowest horizon
Slow (< 4 mm/h)

Aeration in root zone
Moderately limited

Profile available water

(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)
Moderate (35 mm)	Low (57 mm)	Moderate to low (82 mm)

Dry bulk density

topsoil	subsoil
1.22 g/cm³	1.53 g/cm³

Soil chemical properties

Topsoil P retention
Low (19%)

Soil management factors

Vulnerability classes relate to soil properties only and do not take into account climate or management

Soil structure integrity

Structural vulnerability
High (0.67)

Pugging vulnerability
not available yet

Septic tank installation category
A1 if slope > 15 deg otherwise B4

Contaminant management

N leaching vulnerability
High

P leaching vulnerability
not available yet

Dairy effluent (FDE) risk category
D

MGM N Loss Category
Light (on the plains and downs)

MGM P Loss Category
High risk of Leaching to ground water (on flat slopes)

Water management

Water logging vulnerability
Moderate

Drought vulnerability - if not irrigated
Moderate

Bypass flow
High

Hydrological soil group
C

Relative Runoff Potential

Slope	0-3°	4-7°	8-15°	16-25°	>25°
Risk	L	M	H	H	H

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Darnley_6a.1

Soil physical properties

Depth class (diggability)
Very shallow (0 - 20 cm)

Potential rooting depth
Unlimited

Rooting barrier
No significant barrier within 1 r

Depth to hard rock
No hard rock within 1 m

Depth to soft rock
No soft rock within 1 m

Depth to stony layer class
Shallow

Texture profile
Silt

Topsoil stoniness
Very stony

Topsoil clay range
15 - 20 %

Drainage class
Moderately well drained

Permeability profile
Moderate over slow

Depth to slowly permeable horizon
45 - 65 (cm)

Permeability of slowest horizon
Slow (< 4 mm/h)

Aeration in root zone
Moderately limited

Profile available water

(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)
Moderate (35 mm)	Low (57 mm)	Moderate to low (82 mm)

Dry bulk density

topsoil	subsoil
1.22 g/cm³	1.53 g/cm³

Soil chemical properties

Topsoil P retention
Low (19%)

Soil management factors

Vulnerability classes relate to soil properties only and do not take into account climate or management

Soil structure integrity

Structural vulnerability
High (0.67)

Pugging vulnerability
not available yet

Septic tank installation category
A1 if slope > 15 deg otherwise B4

Contaminant management

N leaching vulnerability
High

P leaching vulnerability
not available yet

Dairy effluent (FDE) risk category
D

MGM N Loss Category
Light (on the plains and downs)

MGM P Loss Category
High risk of Leaching to ground water (on flat slopes)

Water management

Water logging vulnerability
Moderate

Drought vulnerability - if not irrigated
Moderate

Bypass flow
High

Hydrological soil group
C

Relative Runoff Potential

Slope	0-3°	4-7°	8-15°	16-25°	>25°
Risk	L	M	H	H	H

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S O I L R E P O R T

Environment Canterbury

Darnley_7a.1

Report generated: 2-Aug-2023 from https://smap.landcareresearch.co.nz

Darn_7a.1 (10% of the mapunit at location (1562224, 5198376), Confidence: High)

This information sheet describes the typical average properties of the specified soil to a depth of 1 metre, and should not be the primary source of data when making land use decisions on individual farms and paddocks. S-map correlates soils across New Zealand. Both the old soil name and the new correlated (soil family) name are listed below.

Capture of the base soil information in this region was funded by Environment Canterbury, Manaaki Whenua and MPI.

Soil Classification

Soil Classification:
Typic Argillic Pallic Soils (PJT)

Family Name:
Darnley (Darn)

Sibling Name:
Darnley_7a.1 (Darn_7a.1)

Soil profile material
Rounded stony soil

Depth class (diggability)
Shallow (15 - 35 cm)

Profile texture
silt

Parent Material

Stones/rocks
hard sandstone rock

Soil material
hard sandstone rock

Origin
Alluvium

Soil Sibling Concept

This soil belongs to the Pallic soil order of the New Zealand soil classification. Pallic Soils have pale coloured subsoils, due to low contents of iron oxides, have weak soil structure and high density in subsurface horizons. Pallic Soils tend to be dry in summer and wet in winter. It is formed in alluvial sand silt or gravel deposited by running water, from hard sandstone parent material.

The topsoil typically has silt texture and is moderately stony. The subsoil has dominantly silt textures, with a very gravelly layer from less than 45 cm mineral soil depth to more than 100 cm. The plant rooting depth is 60 - 90 (cm), due to an extremely gravelly horizon with extremely low water storage capacity.

Generally the soil is moderately well drained with moderate vulnerability of water logging in non-irrigated conditions, and has moderate to low soil water holding capacity. Inherently these soils have a high structural vulnerability and a high N leaching potential, which should be accounted for when making land management decisions.

Allan Hewitt ©

Argillic
Pallic

About this publication

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Darnley_7a.1

Soil physical properties

Depth class (diggability)
Shallow (15 - 35 cm)

Potential rooting depth
60 - 90 (cm)

Rooting barrier
Extremely gravelly

Depth to hard rock
No hard rock within 1 m

Depth to soft rock
No soft rock within 1 m

Depth to stony layer class
Shallow

Texture profile
Silt

Topsoil stoniness
Moderately stony

Topsoil clay range
15 - 30 %

Drainage class
Moderately well drained

Permeability profile
Moderate over slow

Depth to slowly permeable horizon
30 - 80 (cm)

Permeability of slowest horizon
Slow (< 4 mm/h)

Aeration in root zone
Moderately limited

Profile available water

(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)
Moderate (44 mm)	Moderate (67 mm)	Moderate to low (78 mm)

Dry bulk density

topsoil	subsoil
1.22 g/cm³	1.42 g/cm³

Soil chemical properties

Topsoil P retention
Low (19%)

Soil management factors

Vulnerability classes relate to soil properties only and do not take into account climate or management

Soil structure integrity

Structural vulnerability
High (0.64)

Pugging vulnerability
not available yet

Septic tank installation category
A1 if slope > 15 deg otherwise B4

Contaminant management

N leaching vulnerability
High

P leaching vulnerability
not available yet

Dairy effluent (FDE) risk category
D

MGM N Loss Category
Very light (on the plains and downs)

MGM P Loss Category
High risk of Leaching to ground water (on flat slopes)

Water management

Water logging vulnerability
Moderate

Drought vulnerability - if not irrigated
Moderate

Bypass flow
High

Hydrological soil group
C

Relative Runoff Potential

Slope	0-3°	4-7°	8-15°	16-25°	>25°
Risk	L	M	M	M	M

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SOIL REPORT

Environment Canterbury

Leeston_1a.1

Report generated: 2-Aug-2023 from https://smap.landcareresearch.co.nz

Lees_1a.1 (40% of the mapunit at location (1562498, 5198704), Confidence: Medium)

This information sheet describes the typical average properties of the specified soil to a depth of 1 metre, and should not be the primary source of data when making land use decisions on individual farms and paddocks. S-map correlates soils across New Zealand. Both the old soil name and the new correlated (soil family) name are listed below.

Capture of the base soil information in this region was funded by Environment Canterbury, Manaaki Whenua and MPI.

Soil Classification

Soil Classification:
Argillic Orthic Gley Soils (GOJ)

Family Name:
Leeston (Lees)

Sibling Name:
Leeston_1a.1 (Lees_1a.1)

Soil profile material
Rounded stony soil

Depth class (diggability)
Shallow (20 - 45 cm)

Profile texture
clay

Parent Material

Stones/rocks
hard sandstone rock

Soil material
hard sandstone rock

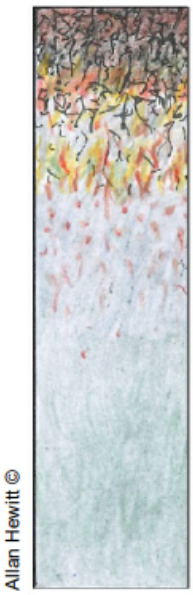
Origin
Alluvium

Soil Sibling Concept

This soil belongs to the Gley soil order of the New Zealand soil classification. Gley soils are strongly affected by waterlogging, have been chemically reduced, have light grey subsoils, and usually have reddish brown or brown mottles. Waterlogging occurs in winter and spring, and some soils remain wet all year. It is formed in alluvial sand silt or gravel deposited by running water, from hard sandstone parent material.

The topsoil typically has clay texture and is slightly stony. The subsoil has dominantly clay textures, with a very gravelly layer from less than 45 cm mineral soil depth to more than 100 cm. The plant rooting depth is 70 - 100 (cm), due to an extremely gravelly horizon with extremely low water storage capacity.

Generally the soil is poorly drained with high vulnerability of water logging in non-irrigated conditions, and has moderate soil water holding capacity. Inherently these soils have a moderate structural vulnerability and a very low N leaching potential, which should be accounted for when making land management decisions.



Allan Hewitt ©

Orthic Gley

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Leeston_1a.1

Soil physical properties

Depth class (diggability)
Shallow (20 - 45 cm)

Potential rooting depth
70 - 100 (cm)

Rooting barrier
Extremely gravelly

Depth to hard rock
No hard rock within 1 m

Depth to soft rock
No soft rock within 1 m

Depth to stony layer class
Shallow

Texture profile
Clay

Topsoil stoniness
Slightly stony

Topsoil clay range
30 - 45 %

Drainage class
Poorly drained

Permeability profile
Moderate over slow

Depth to slowly permeable horizon
40 - 100 (cm)

Permeability of slowest horizon
Slow (< 4 mm/h)

Aeration in root zone
Limited

Profile available water

(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)
High (53 mm)	High (91 mm)	Moderate (111 mm)

Dry bulk density

topsoil	subsoil
0.87 g/cm³	1.01 g/cm³

Soil chemical properties

Topsoil P retention
Medium (38%)

Soil management factors

Vulnerability classes relate to soil properties only and do not take into account climate or management

Soil structure integrity

Structural vulnerability
Moderate (0.57)

Pugging vulnerability
not available yet

Septic tank installation category
A1 if slope > 15 deg otherwise B2

Contaminant management

N leaching vulnerability
Very low

P leaching vulnerability
not available yet

Dairy effluent (FDE) risk category
B

MGM N Loss Category
Poorly drained (on the plains and downs)

MGM P Loss Category
Moderate risk of Runoff to surface water

Water management

Water logging vulnerability
High

Drought vulnerability - if not irrigated
Moderate

Bypass flow
High

Hydrological soil group
C/D

Relative Runoff Potential

Slope	0-3°	4-7°	8-15°	16-25°	>25°
Risk	M	M	H	VH	VH

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Manaaki Whenua
Landcare Research

SOIL REPORT

Environment Canterbury

Leeston_3a.1

Report generated: 2-Aug-2023 from https://smap.landcareresearch.co.nz

Lees_3a.1 (15% of the mapunit at location (1562498, 5198704), Confidence: Medium)

This information sheet describes the typical average properties of the specified soil to a depth of 1 metre, and should not be the primary source of data when making land use decisions on individual farms and paddocks. S-map correlates soils across New Zealand. Both the old soil name and the new correlated (soil family) name are listed below.

Capture of the base soil information in this region was funded by Environment Canterbury, Manaaki Whenua and MPI.

Soil Classification

Soil Classification:
Argillic Orthic Gley Soils (GOJ)

Family Name:
Leeston (Lees)

Sibling Name:
Leeston_3a.1 (Lees_3a.1)

Soil profile material
Rounded stony soil

Depth class (diggability)
Shallow (20 - 40 cm)

Profile texture
clay

Parent Material

Stones/rocks
hard sandstone rock

Soil material
hard sandstone rock

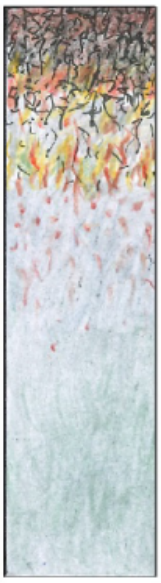
Origin
Alluvium

Soil Sibling Concept

This soil belongs to the Gley soil order of the New Zealand soil classification. Gley soils are strongly affected by waterlogging, have been chemically reduced, have light grey subsoils, and usually have reddish brown or brown mottles. Waterlogging occurs in winter and spring, and some soils remain wet all year. It is formed in alluvial sand silt or gravel deposited by running water, from hard sandstone parent material.

The topsoil typically has clay texture and is moderately stony. The subsoil has dominantly clay textures, with a very gravelly layer from less than 45 cm mineral soil depth to more than 100 cm. The plant rooting depth is 65 - 100 (cm), due to an extremely gravelly horizon with extremely low water storage capacity.

Generally the soil is poorly drained with very high vulnerability of water logging in non-irrigated conditions, and has moderate to low soil water holding capacity. Inherently these soils have a moderate structural vulnerability and a moderate N leaching potential, which should be accounted for when making land management decisions.



Allan Hewitt ©

Orthic Gley

About this publication

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Manaaki Whenua
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SOIL REPORT

Environment Canterbury

Pahau_2a.1

Report generated: 2-Aug-2023 from https://smap.landcareresearch.co.nz

Paha_2a.1 (50% of the mapunit at location (1562224, 5198376), Confidence: High)

This information sheet describes the typical average properties of the specified soil to a depth of 1 metre, and should not be the primary source of data when making land use decisions on individual farms and paddocks. S-map correlates soils across New Zealand. Both the old soil name and the new correlated (soil family) name are listed below.

Capture of the base soil information in this region was funded by Environment Canterbury, Manaaki Whenua and MPI.

Soil Classification

Soil Classification:
Mottled Argillic Pallic Soils (PJM)

Family Name:
Pahau (Paha)

Sibling Name:
Pahau_2a.1 (Paha_2a.1)

Soil profile material
Moderately deep soil

Depth class (diggability)
Moderately deep (70 - 90 cm)

Profile texture
silt

Parent Material

Stones/rocks
hard sandstone rock

Soil material
hard sandstone rock

Origin
Alluvium

Soil Sibling Concept

This soil belongs to the Pallic soil order of the New Zealand soil classification. Pallic Soils have pale coloured subsoils, due to low contents of iron oxides, have weak soil structure and high density in subsurface horizons. Pallic Soils tend to be dry in summer and wet in winter. It is formed in alluvial sand silt or gravel deposited by running water, from hard sandstone parent material.

The topsoil typically has silt texture and is stoneless. The subsoil has dominantly silt textures, with a very gravelly layer that starts at or below 45 cm soil mineral depth and extends continuously to 100 cm. The plant rooting depth extends beyond 1m.

Generally the soil is imperfectly drained with moderate vulnerability of water logging in non-irrigated conditions, and has moderate soil water holding capacity. Inherently these soils have a high structural vulnerability and a moderate N leaching potential, which should be accounted for when making land management decisions.

Allan Hewitt ©

Argillic
Pallic

About this publication

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Pahau_2a.1

Soil physical properties

Depth class (diggability)
Moderately deep (70 - 90 cm)

Potential rooting depth
Unlimited

Rooting barrier
No significant barrier within 1 r

Depth to hard rock
No hard rock within 1 m

Depth to soft rock
No soft rock within 1 m

Depth to stony layer class
Moderately deep

Texture profile
Silt

Topsoil stoniness
Stoneless

Topsoil clay range
18 - 35 %

Drainage class
Imperfectly drained

Permeability profile
Moderate over slow

Depth to slowly permeable horizon
50 - 80 (cm)

Permeability of slowest horizon
Slow (< 4 mm/h)

Aeration in root zone
Moderately limited

Profile available water

(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)
Moderate (48 mm)	Moderate (82 mm)	Moderate (116 mm)

Dry bulk density

topsoil	subsoil
1.22 g/cm³	1.53 g/cm³

Soil chemical properties

Topsoil P retention
Low (19%)

Soil management factors

Vulnerability classes relate to soil properties only and do not take into account climate or management

Soil structure integrity

Structural vulnerability
High (0.67)

Pugging vulnerability
not available yet

Septic tank installation category
A1 if slope > 15 deg otherwise B4

Contaminant management

N leaching vulnerability
Medium

P leaching vulnerability
not available yet

Dairy effluent (FDE) risk category
B

MGM N Loss Category
Medium (on the plains and downs)

MGM P Loss Category
No significant pathways

Water management

Water logging vulnerability
Moderate

Drought vulnerability - if not irrigated
Moderate

Bypass flow
Medium

Hydrological soil group
C

Relative Runoff Potential

Slope	0-3°	4-7°	8-15°	16-25°	>25°
Risk	VL	L	M	H	H

SINDI - Soil quality Indicators

SINDI - Soil Quality Indicators

A suite of soil quality indicators is available from http://sindi.landcareresearch.co.nz/

- Compare your soil with information from our soils databases.
- Assess the intrinsic resources and biological, chemical and physical quality of your soil
- See how your soil measures up against current understanding of optimal values.
- Learn about the effect each indicator has on soil quality and some general management practices that could be implemented to improve soil quality.

Manaaki Whenua
Landcare Research

S O I L R E P O R T

Environment Canterbury

Pahau_31a.1

Report generated: 2-Aug-2023 from https://smap.landcareresearch.co.nz

Paha_31a.1 (30% of the mapunit at location (1562498, 5198704), Confidence: Medium)

This information sheet describes the typical average properties of the specified soil to a depth of 1 metre, and should not be the primary source of data when making land use decisions on individual farms and paddocks. S-map correlates soils across New Zealand. Both the old soil name and the new correlated (soil family) name are listed below.

Capture of the base soil information in this region was funded by Environment Canterbury, Manaaki Whenua and MPI.

Soil Classification

Soil Classification:
Mottled Argillic Pallic Soils (PJM)

Family Name:
Pahau (Paha)

Sibling Name:
Pahau_31a.1 (Paha_31a.1)

Soil profile material
Moderately deep soil

Depth class (diggability)
Moderately deep (45 - 90 cm)

Profile texture
silt over clay

Parent Material

Stones/rocks
hard sandstone rock

Soil material
hard sandstone rock

Origin
Alluvium

Soil Sibling Concept

This soil belongs to the Pallic soil order of the New Zealand soil classification. Pallic Soils have pale coloured subsoils, due to low contents of iron oxides, have weak soil structure and high density in subsurface horizons. Pallic Soils tend to be dry in summer and wet in winter. It is formed in alluvial sand silt or gravel deposited by running water, from hard sandstone parent material.

The topsoil typically has silt texture and is stoneless. The subsoil has dominantly clay textures, with a very gravelly layer that starts at or below 45 cm soil mineral depth and extends continuously to 100 cm. The plant rooting depth extends beyond 1m.

Generally the soil is imperfectly drained with high vulnerability of water logging in non-irrigated conditions, and has moderate soil water holding capacity. Inherently these soils have a high structural vulnerability and a moderate N leaching potential, which should be accounted for when making land management decisions.

Allan Hewitt ©

Argillic
Pallic

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Pahau_31a.1

Soil physical properties

Depth class (diggability)
Moderately deep (45 - 90 cm)

Potential rooting depth
Unlimited

Rooting barrier
No significant barrier within 1 r

Depth to hard rock
No hard rock within 1 m

Depth to soft rock
No soft rock within 1 m

Depth to stony layer class
Moderately deep

Texture profile
Silt over clay

Topsoil stoniness
Stoneless

Topsoil clay range
20 - 35 %

Drainage class
Imperfectly drained

Permeability profile
Moderate over slow

Depth to slowly permeable horizon
30 - 70 (cm)

Permeability of slowest horizon
Slow (< 4 mm/h)

Aeration in root zone
Limited

Profile available water

(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)
Moderate (48 mm)	Moderate (75 mm)	Moderate (103 mm)

Dry bulk density

topsoil	subsoil
1.22 g/cm³	1.53 g/cm³

Soil chemical properties

Topsoil P retention
Low (19%)

Soil management factors

Vulnerability classes relate to soil properties only and do not take into account climate or management

Soil structure integrity

Structural vulnerability
High (0.66)

Pugging vulnerability
not available yet

Septic tank installation category
A1 if slope > 15 deg otherwise B4

Contaminant management

N leaching vulnerability
Medium

P leaching vulnerability
not available yet

Dairy effluent (FDE) risk category
B

MGM N Loss Category
Light (on the plains and downs)

MGM P Loss Category
No significant pathways

Water management

Water logging vulnerability
High

Drought vulnerability - if not irrigated
Moderate

Bypass flow
High

Hydrological soil group
D

Relative Runoff Potential

Slope	0-3°	4-7°	8-15°	16-25°	>25°
Risk	L	M	H	H	H

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